

Cardinality of the Ellis semigroup on compact countable metrizable spaces

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In a dynamical system (X, f) the space X will be compact metric, $E(X, f)$ will denote its Ellis semigroup and

$$E(X, f)^* = E(X, f) \setminus \{f^n : n \in \mathbb{N}\}.$$

We analyze the cardinality of $E(X, f)$ for certain compact spaces. Necessary and sufficient conditions for (X, f) are given in order that either $E(X, f)$ or $E(X, f)^*$ be finite. We show that if the set of all periods of the periodic points of (X, f) is infinite, then $E(X, f)$ has at least size 2^{\aleph_0} . We also prove that if (X, f) has a point with dense orbit and all elements of $E(X, f)^*$ are continuous, then $|E(X, f)^*| \leq |X|$. With respect to a dynamical system of the form $(\omega^2 + 1, f)$, we show if it has a point with dense orbit, then $E(\omega^2 + 1, f)^*$ is countable and all its elements are continuous functions. We give several examples related to the main results.

